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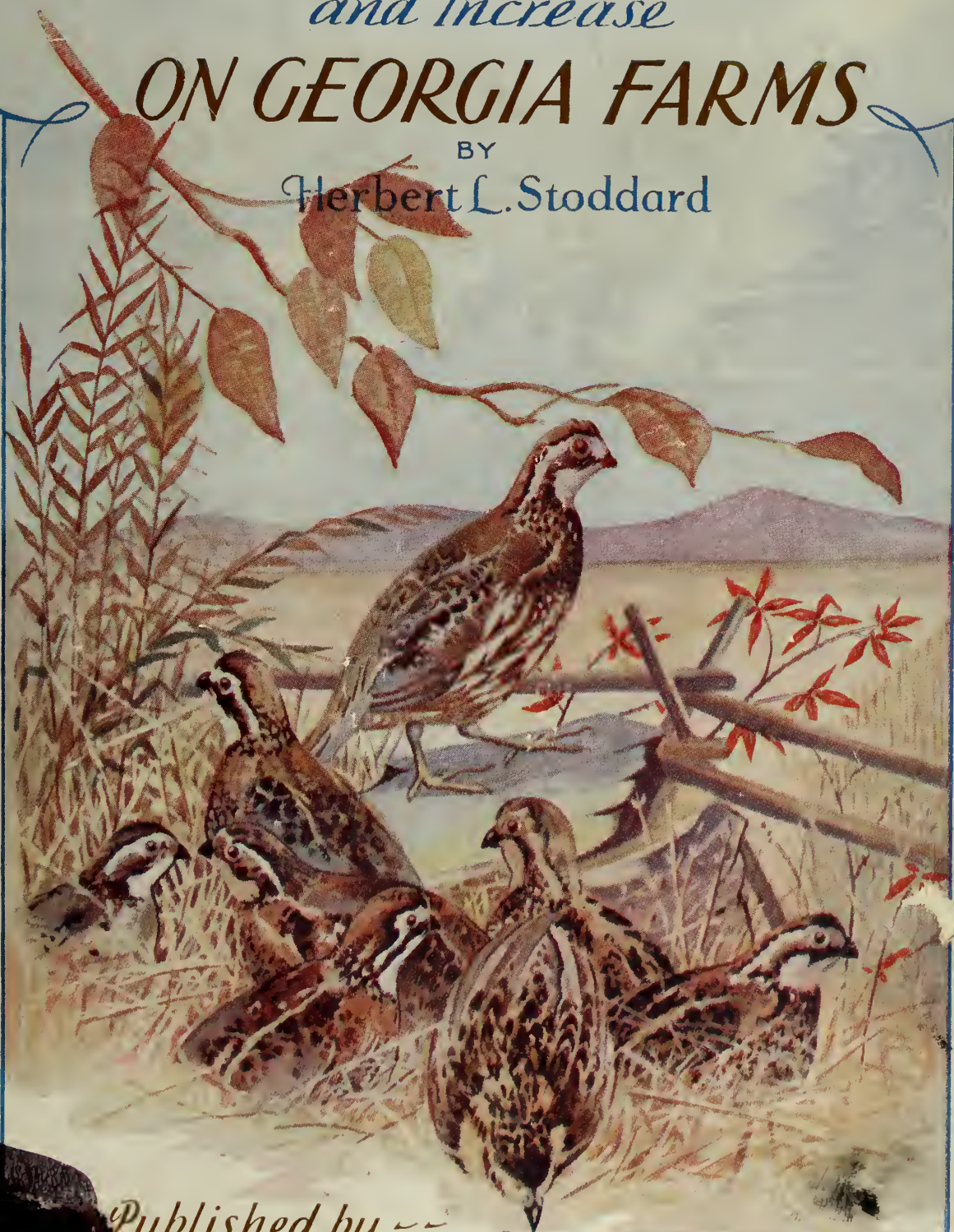
THE BOBWHITE QUAIL

*Its Propagation, Preservation
and Increase*

ON GEORGIA FARMS

BY

Herbert L. Stoddard



Published by --

STATE DEPARTMENT OF GAME & FISH

PETER S. TWITTY - COMMISSIONER



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FOREWORD

Why do species of native wild life become extinct?

The problem, in its broad sense, is not isolated to any locality or subdivision of our country. In the origin of wild life Nature worked out a scheme of placement for the several species of birds and animals. In their respective allocations they thrived, multiplied and were abundant. On Martha's Vineyard Island, in Massachusetts, the last heath hen on earth disappeared May 9, 1931. The specie, once abundant, has gone to final absolute extinction.

In the Southern States, particularly, the bobwhite quail was allocated, by Nature, as a species of wild life. It thrived, multiplied and supplied "the sport of kings" among huntsmen. Nature has not changed, but: What has become of our bobwhite quail? Has man and his habits so fast encroached upon the capacity of wild nature to re-supply that the species is arriving at extinction?

The "Sport of Kings" Why is it we do not have as many bobwhite as there were only a few years ago? What direct cause or causes of destruction can be working to the elimination of this "sport of kings" as it was "in the good old days?" What is being done, or what can be done, to bring back that desirable state; to revive and replenish the abundant





supply of bobwhite, and then to protect and preserve them?

Science has applied itself to an analysis of causes and students of Nature have devoted themselves to arrive at a solution and afford answers to these and scores of similar questions arising in the minds of Georgia sportsmen—as they have elsewhere as well.

Causes of Quail Destruction Contributory causes have multiplied as these studies have progressed. Wild cats, skunks, cotton rats and other predatory mammals; prowling dogs and house cats; an alarming increase in the number of foxes; certain species of winged vermin, vampires in their nature, are found to be one form of destructive encroachment. Forest and field fires, largely the careless handiwork of mankind; protracted droughts and unfavorable hatching seasons. Scarcity of the necessary food supply following agrarian expansion by the human family; failure to supply substitute “patches” when natural feeding ground has been destroyed, and an almost ruthless neglect to preserve the natural cover for the bobwhite’s habitat, are among the chief causes of gradual reduction. Pot hunting and bootlegging sales in violation of reasonable conservation regulations; the increasing use of automatic shotguns as a more rapid machine of destruction; excessively long hunting seasons and excessive kills when “luck is good” carrying beyond the regulatory bag limit. All these and other con-





tributary reasons, augmented by an ever-increasing number of hunters, have collectively constituted a tax upon the normal existence of the bobwhite quail in our section of the country which Nature has been unable to cope with.

While sportsmen may differ in their individual conclusions as to the outstanding cause or causes for the present shortage of birds, they all will agree that a shortage does in fact exist. On that conclusion it becomes a duty that we concern ourselves with the present problem of conservation and the future one of rebuilding and increasing the supply by such means as may properly be devised.

The establishment of limited hunting periods, reasonable bag limits, and other purely regulatory provisions of law are not mere prohibitions or restrictions of the hunter's privileges, but are practical conservation measures. These are helps, but they alone can neither bring an increase nor, really, maintain the present supply level of the existing quail family.

As an original or first thought, bobwhite quail cannot survive, therefore cannot increase, unless and until mankind in its avocations constantly extending into the quail's natural habitat provides suitable food and preserves the necessary cover spots. It behooves man, too, to battle against the enemies of the quail, which the quail cannot battle with—the cats, the dogs, predatory wild animals and vermin.

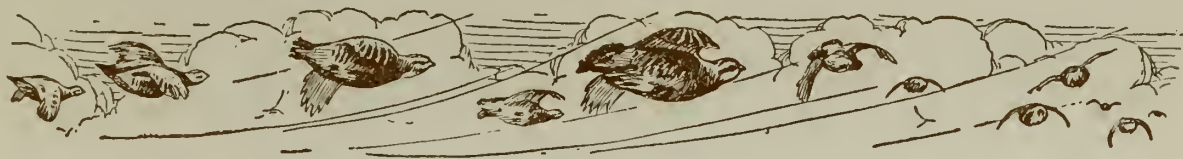




Still Plenty of Seed Stock While this state realizes the growing scarcity in its supply of quail, Georgia's predicament in that respect has not yet reached the really serious aspect existing in other states where was a short time ago the natural habitat of bobwhite. In this state there is a good supply of "seed stock," which, if properly protected and given the normal chance — through protection — to reproduce as Nature intended, should and will furnish a fairly abundant supply for the future years. It has been found, in some of our neighboring states, that Nature's supply is so nearly exhausted that it has become necessary for State Game Departments to resort to the propagation of quail in captivity for use in restocking depleted areas. Many thousands of dollars are being spent every year this way. In some localities in Georgia, this form of resupply has been resorted to.

Attitude of Farmer Georgia, however, is more fortunate than much of our surrounding territory, in that there still is a good stock of native quail, and in the main our major necessary concern needs be that we throw around this stock the proper safeguards in their native environment and give them that fair chance to thrive and multiply which Nature intended for them. This observation is worthy of further explanation. The future status of the bobwhite quail depends largely upon the interest the farmer or landowner takes in the fight the quail is making for its continued existence among





us. The average farmer, unless he also happens to be a good sportsman and hunter, is concerned but very little with the increase or decrease of this bird on his lands. He has not given thought to its value to him; he is not familiar with its habits or its needs. Ordinarily the quail is looked upon by him, as a destroyer of insect pests, therefore a good thing to have around the farm. He does not segregate from this general idea the available knowledge of value to him and his family, the source of saving and enjoyment to the family table, the pleasure and sport to himself and his friends—the actual dollars and cents—in the presence of an abundant supply of quail on his property.

I can not subscribe to any proposal which encourages the propagation of bobwhite quail for the purpose of commercial sale for food purposes. Indeed, I think it would be nothing short of a tragedy, should we permit the commercial sale of quail and other native game birds except for propagation purposes, and then only under closely observed proper regulatory restrictions. One of the present most destructive inroads on the existing supply of quail in Georgia is the illegal operation of pot-hunters and quail bootleggers. On the other hand, however, every encouragement and assistance should be given the farmers of our State to increase the stock of quail on their lands as a means of profit to them, through the lease of hunting rights on their lands to sportsmen's groups or organizations, or the sale of daily hunting privileges to individuals. Many landowners are realizing





sufficient revenue from this source to pay their land taxes. Such a plan should prove a convenient source of revenue to the farmer himself, and would be of broader benefit to the hunters and our people generally.

Quail a Source of Profit to Farmer While the propagation, in captivity, of quail and other game birds by sportsmen, hunting clubs and similar organizations may properly be encouraged, under certain regulatory conditions, this theory probably will prove quite expensive and carry too much uncertainty for the average farmer to undertake as a part of his dependence, but it has been demonstrated time and again that the average farmer can make the quail on his lands a source of profit by protecting and preserving them in their natural habitat.

* * * * *

With this preamble, this booklet is designed to explain to the Georgia farmer, the owner of lands in the country, how the stock of bobwhite quail on his own lands may be increased at minimum cost, and really made a source of profit to him.

There is probably no one in America better qualified to present an understandable discussion of this subject than Mr. Herbert L. Stoddard, who is the author of the series of papers herewith presented, which have been prepared by him especially for the Georgia Department of Game and Fish.





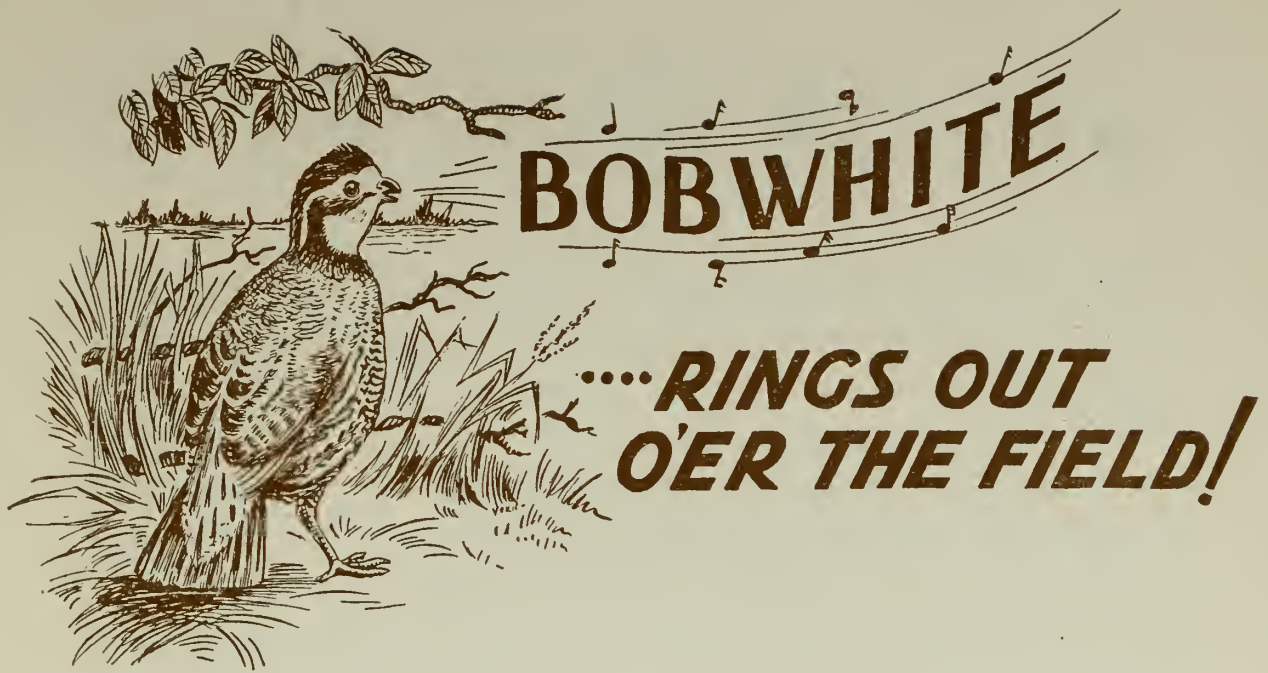
Mr. Stoddard is universally recognized as a leading American authority on the quail and quail raising. He was selected by the United States Bureau of Biological Survey—with which he has been associated for many years—to conduct a five-year quail survey in South Georgia and North Florida. This survey was sponsored by a substantial group of sportsmen of the Southeast. Mr. Stoddard is the author of a book of 600 pages,* now on sale, in which he deals in an exhaustive way with the habits, preservation and increase of bobwhite quail as based on information and experience gained by him in the survey.

The accompanying papers, in this booklet, from the pen of Mr. Stoddard, are commended to a careful reading and understanding.

PETER S. TWITTY, *Commissioner.*

*The Bobwhite Quail, Its Habits, Preservation and Increase. Chas. Scribner & Sons, N. Y.





*The Bobwhite Quail, or Partridge, and Its
Value to Mankind*

HOW many of us, I wonder, ever pause to consider the real economic importance of the quail, or partridge, when we hear his cheery "*bobwhite*" ringing across the summer fields, or the mellow call at dusk as the birds of a bevy rally at the roost, or attempt to evaluate this little brown citizen at his real worth as an asset to the community. Most of us have just taken him for granted, as we do so many of our blessings, and have left him to shift for himself as best he may.

Yet quail shooting rights have been leased year after year for a generation over extensive areas in the Southeast, for an annual rate of from five to twenty cents per acre; enough in many cases to pay the taxes, or in considerable part for the schooling of the rural children, and this without any thought or care on the part of the landowner, who might have realized more by developing this attractive auxiliary crop of the farm. Quail are classed by discriminating sportsmen as *the* upland game bird par-excellence, and many of them travel southward half the length of the Continent just for the privilege of roaming the golden and russet fields for a few never-to-be-forgotten days each year with their pointer and setter companions in the pursuit of



quail. With the liberal hand of sportsmen they spend without stint to satisfy their wants and leave much welcome cash in the communities visited. And the wholesome pleasure afield is not all there is to remember, for "quail on toast" furnishes a dish to delight the epicure, the snow-white breast meat being toothsome beyond compare.

Neither is it necessary for the property owner to lease his shooting rights to others, for he may reserve this pleasure for himself and enjoy at his leisure what others travel so far to seek, and pay so liberally to enjoy.

Many, however, appreciate the worth of the little brown birds, and quail are now imported into the United States from Mexico to the number of nearly a hundred thousand a year to restock areas where too many have been shot, or that are for other reasons understocked. And although it seems like "carrying coals to Newcastle" to import quail into the heart of their Southeastern stronghold, not a few of the imported birds find their way to Georgia, Florida or other Southeastern States, and this at a cost ranging from two to three dollars apiece. Native quail, usually obtainable only if artificially propagated, find an equally ready market at from three to four dollars each. These figures, high as they are pale into insignificance in comparison with the expenditures freely made by many sportsmen in the upkeep of estates held primarily for quail shooting, where quail, wild turkeys and other game are brought to abundance by the development of food supply and cover, the





control of natural enemies and by artificial propagating. Not only do these great places furnish sanctuary to large numbers of non-game birds and mammals, but they act as reservoirs of game and improve shooting over the surrounding country through natural overflow.

An abundance of quail is also a decided asset to the farmer in his perpetual warfare against insect enemies of his crops. Quail eat practically all kinds of insects found in their zone of operations; the surface of the ground and jumping distance above it. In many cases potatoes, squashes and other low-growing crops are relieved of untold numbers of damaging pests. It is a comforting thought to the knowing farmer as well to consider the hundreds of seeds of ragweed, pigweed and others against which he and his forebears have waged a bitter warfare, in the bulging crops of the covey members. Doing a vast amount of good and very little harm to agricultural interests, it is no wonder that quail are popular birds with the farmer.

It is more difficult to evaluate in dollars and cents the pleasures derived from things in Nature that delight the eye or the ear, and quail contribute as much, perhaps, as any living creatures to wholesome pleasures of the countryside. The mellow, far-reaching rallying call at dusk, the cheery "*bobwhite*" ringing across fields still sparkling from the passing shower, or the sight of handsome cock and hen with their brood of a dozen alert, bright-eyed chicks feeding deployed through the garden, are things that delight the soul





of many, just as truly as do the more expensive pleasures of the opera.

Thus it will be seen that sportsmen, farmers and lovers of the outdoors in general all have good reason for desiring an abundance of quail. In some places, largely through lack of understanding and by virtue of power at the ballot, farmers and others have combined against the sportsmen and deprived him permanently of his greatest pleasure, the privilege of hunting partridges for a time each year, while in others thoughtless gunners, through an over indulgence in their sport, have decimated the stock and deprived farmer and Nature lover of their just rights. This state of affairs is most regrettable for quail can be produced by simple measures in any desired numbers and indulgence in quail shooting must be in proportion to production if the sport is to endure.

Recent studies have shown that the measures necessary to build up and maintain an abundance of quail, for the pleasure and profit of all classes, are really very simple, although they may not fit in with cleanup programs of many farmers and road commissioners, who by their practices unwittingly deprive quail and other birds of shelter necessary to their very existence. In the series of articles following, the requirements of quail will be briefly outlined, and methods of satisfying these requirements discussed in the hope that more people will be encouraged to take measures to increase quail, much to their pleasure and profit.



Type of Cover Frequented by Bobwhite Quail

THE bobwhite quail is dependent for its very existence upon a screen of concealing vegetation to shelter it from the attack of its numerous natural enemies, for its flesh is tasty and much sought after by predatory creatures who gain their living by tooth and claw. It thrives, moreover, only where ground vegetation of the proper density prevails, being unduly exposed to attack where it is too scant and excluded for other reasons where it is too thick. Thus the matter of proper cover is of the utmost importance on lands where quail are desired in abundance, though it is seldom understood or attended to.

Perhaps first in importance is "refuge cover;" thickets and vine tangles around field borders, on fence lines and roadsides, and here and there in open woodlands, to which quail can resort when pursued. Seldom do quail feed out more than two or three hundred yards from refuge cover, less as a rule where enemies are numerous, for while they can outstrip "blue darters" (Cooper's and sharp-shinned hawks), for a short distance, they are doomed if they have far to fly. Where farmers cut out such refuge cover to give their farms an air of "neatness," or road commissioners chop out the thickets along little travelled back roads, a decline in the numbers of quail and other thicket-loving





birds is inevitable, for it exposes them to the attack of enemies who catch them off one by one till all are gone.

This does not mean, of course, that country mostly grown up to thicket is particularly favorable, for farmlands with numerous small, well distributed thickets, constituting perhaps five to ten per cent. of the area usually support the greatest abundance of quail and other bird-life, other things being equal. The ideal condition from the standpoint of the quail consists of numerous small fields, both in cultivation and fallow, fringed with thickets and separated by open woodlands of small extent; in other words maximum diversification of cover types.

Ground growth of an open type with light litter beneath as in stubble fields grown up to ragweed and other weeds, furnishes highly favorable feeding ground, for not only is more food produced in such cover, but of even greater importance, seeds that fall to the ground are easily found by the birds. Although quail scratch to a limited extent, in the well-known manner of the domestic fowl, they cannot feed where heavy litter covers the ground to a depth of several inches, and avoid such areas for feeding to a large extent.

This is the reason in part why quail invariably decline in numbers when fields have been abandoned and grow up to heavy broom sedge. Not only does this sedge become too dense for the birds to feed through, but it chokes out the





weeds and legumes (such as the bush clovers, beggarweeds and wild beans), which furnish the birds with food.

The same thing happens, unfortunately, in many cases where fire is excluded from open woodlands in the interest of forest growth; as the condition develops commonly known in the South as the "rough," and the birds are forced either to leave the area entirely or spend their time in the plowed or burned-out fire lines and such open situations as are left to them. This cannot well be helped, of course, for it is often necessary to exclude fire in the interest of valuable forest growth, but it is well to know why the birds decline under such conditions. Fortunately "rough" of sufficient density to exclude quail does not develop in all regions, or on all soil types.

If quail are particular in regard to the density of grasses and sedges in their feeding ground, they are even more so in their selection of nesting sites, the nests either being built among grasses so open below that the birds can run through them freely and easily, or on the edge of paths, roads, field borders or similar situations open on one side. This is necessary, for quail, particularly the young birds, wet easily and become bedraggled if forced to move about in rainy weather in cover dense at their level.

Thus there are several reasons why it is necessary to pay some attention to the matter of cover for these fine game birds, and consider their needs when "brushing out" or cleaning up around the farm, else they be unwittingly lost





to the place. Cover conditions are usually favorable to them in regions where farming is general, but not too intensive, while the reverse is often true when agricultural lands are abandoned and are in the process of "reverting to Nature," for one of the first steps in the cycle is the choking up of the fields with broom sedge, and the loss of the bordering thickets through sweeping fires.



The Diet of the Quail: Weed Seeds, Grains and Miscellaneous Vegetable Matter

THE bobwhite quail, or partridge, has a varied diet which includes a wide variety of both animal and vegetable matter; in this article we will consider only that portion of the diet furnished by weeds, grasses and other ground growth, reserving the discussion of the insects, fruits and "mast" from trees for later articles of the series. Even with this division of the subject only a few of the most important items of diet can be mentioned.

While quail are fond of cowpeas, soybeans, corn, millet, sorghum, wheat and other cultivated small grains, the greater portion of such grains eaten are gleaned from the fields after harvest, and seldom is appreciable damage done to newly planted grains or to the growing crops. And even in country where much small grain is grown, the great bulk of the food of the quail is made up of the seeds of despised weeds and grasses that grow in the crops, or from wild plants of fallow or uncultivated ground.

For instance, wheat stubble is justly famous quail ground in many cases, but the ragweed that volunteers in the stubble is of vastly greater importance to the quail than the wheat itself. The same is true of the cornfield. Small weedy cornfields, such as are common in South Georgia and Flor-





ida, are recognized as about the most favorable of all quail range. This is not primarily because of the corn however, but to the weeds and grasses that mature heavy crops of rich seeds after the corn is "laid by." Bull, or water grass, an abundant and heavy seeding *Paspalum* of rich, low spots in cornfields furnishes one of the most important of all foods of growing quail in late summer and fall, and of the mature birds later in the year, while Florida beggarweed, which volunteers luxuriantly in many Southern cornfields that are planted and "laid by" early, has no known superior as a quail food of winter and early spring. Other valuable foods of the weedy cornfields are ragweed, pigweed, rough button-weed, Mexican clover, or "pursley" and various grasses, weeds, morning glories and others too numerous to mention. Quail are very fond of a variety of green food and eat the tender green leaves of the sorrels, clover and other succulent plants, a form of food essential to their health.

As a group the legumes are of outstanding importance to quail, and many species grow in open woodlands, around field borders and gulleys and elsewhere. Of these legumes the beggarweeds (fifteen or more native, perennial species), and the lespedezas, or bush clovers (four or more native perennial species and the introduced Japan clover), are of great importance as they furnish reliable, preferred and wholesome food, especially during the cold months.

Many species of small wild beans, such as the downy



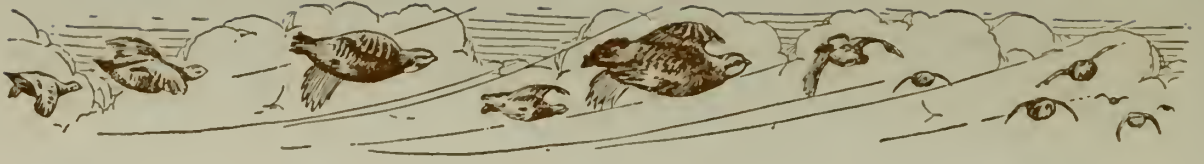


milk pea, butterfly pea, hog peanut, and others grow in partly shaded situations in open pinelands, the small gray marked beans furnishing a preferred food of quail. Two kinds of partridge pea (*Chamaecrista*) are abundant in open woodlands and fallow fields all over the South. The hard, flat, black seeds furnish one of the most important of all winter quail foods. Like in the case of native wild legumes, partridge pea is most abundant on lands that are burned over in winter.

Many measures may be taken on the average farm to increase or improve the food for quail, and help to bring about an increase in their numbers. Small hard cowpeas, and Florida beggarweed can be planted in corn at the time of the last cultivation, especially in the outside rows near thicket cover, which will improve conditions for the game. In case Japan clover (*Lespedeza*) is not widely distributed on the farm, seed can be broadcast in March around gulleys and washes, on roadsides, around the borders of fields and like situations. Once started, Japan clover volunteers year after year unless killed out by burning the land over *after the seed germinates in late February or March*. When harvesting small grain a few rows on the outside near cover may be advantageously left for the birds.

On game preserves, where the largest possible surplus of quail is desired, small patches of Florida beggarweed, Japan clover, millet, cowpeas, soybeans, sorghum and other small grains are frequently planted especially for the birds, but





this is seldom really necessary where "old fashioned" farming still prevails.

It is evident from the foregoing that while quail are an ally of the farmer in his fight against insects and weeds, they would disappear if the battle were won, and the weeds especially are desirable where quail are highly regarded as a supplementary farm crop. After all, weeds are just as necessary for quail as are grains for man and his domesticated animals.



Diet of the Quail: Fruits and "Mast" from Trees

IN the last article we pointed out the importance of the seeds of weeds, grasses and small grains to quail, and suggested methods of increasing this portion of the food supply, as one of the most logical means of securing an increase in the quail supply, for such foods are important and usually subject to quick increase. This, however, is not the case with the majority of foods discussed in the present article.

Quail are fond of, and more or less dependent upon a wide variety of small wild fruits, and the "mast" from trees for their living, and such a food supply is highly desirable. Both young and mature quail are very fond of the fruits of wild black cherry, dewberries, sassafras, cane, blackberries, wild plum, blue and huckleberries, and particularly mulberries during the summer months, and spend much of their time near an abundant supply. Their fondness for mulberries, especially the variety known as Hick's Everbearing, which bears an abundance of luscious fruit from May to August, often entices them into dooryards where they are endangered by the family cat, or where they may acquire dangerous diseases or parasites through contact with ground fouled by domestic poultry.





During the fall and winter months they are equally fond of the fruits of the black gum, American beautyberry, of "French mulberry," flowering dogwood, sparkleberry, gall berry, wild grapes, sumac and various other fruits.

Fruits such as those mentioned are often abundant on not too intensively cultivated farm lands of Georgia and Florida, but it is well to remember their value to quail, wild turkeys and other birds when considering the cutting of wild cherry for fence posts, and burning or brushing out around fields and along fence lines, roadsides and so forth, for the destruction of such food and shelter producing vegetation may be the means of reducing the number of quail on the farm. Where wild fruits are largely absent quail can be attracted by the planting of Hick's Everbearing mulberries about the property, perhaps one tree to each ten or fifteen acres being enough. Mulberries must be well cared for and carefully protected from fire, especially when young, if they are to flourish.

Quail are very fond of acorns, especially the smaller kinds, such as chinquapins, and those of turkey oak, willow oak, water oak and live oak as well as various ground oaks. Acorns too large for them to swallow whole are frequently broken up by a pinch from the powerful beak, or bits wasted by hogs, squirrels, jay or other creatures are eaten.

They are also very fond of the seeds, or "mast" of the sweet gum and the various pines. It is well to consider this when considering cutting out large isolated sweet gum trees





between fields, cutting out oaks among pines, or thinning out the loblolly, short-leaf or black pines when opening up stands of long-leaf or slash pine. Often in cutting out supposedly worthless scrub oak, the valuable (for game) turkey oaks are sacrificed.

It is frequently such simple measures as saving the food producing trees and shrubs mentioned when brushing, cutting or burning on the farm, that makes the difference between success and failure as far as the quail crop is concerned. Seldom is it necessary to carry on wholesale planting of trees and shrubs especially for the birds; it is only necessary to leave some of each kind when engaged in clean-up work about the grounds. An abundance of fruits and "mast" help maintain an abundance of quail and other birds, which in turn help to save the planted crops by combatting insect pests that would destroy them.



Diet of the Bobwhite Quail: Animal Food

IN the two preceding articles of this series we discussed the vegetable food of the quail and suggested methods of increasing this necessary part of the food supply as one means of increasing the numbers of these fine game birds. In this article we will discuss the foods drawn from the Animal Kingdom, not because this class of food lends itself to artificial increase but because it is necessary to know all sources of the quail's food supply to properly understand and evaluate them.

Contrary to the general belief of many who know quail well only during the hunting season, these birds eat much animal matter throughout the year south of the region of deep snows, especially, of course, during the summer months when insects are most numerous. Studies of the Co-operative Quail Investigation in Georgia and Florida showed that animal food constituted about 14 per cent. of the total diet of the adult birds. It averaged about 21 per cent. for the months from April to October inclusive, and a little over 4 per cent. for the remainder of the year. Of the animal food grasshoppers and crickets furnished approximately one-half. Beetles provided important, furnishing nearly 3 per cent. of the whole food; the remaining 4 per cent. being made up of a wide variety of insects and other animal life. With the exception of a few large,





dangerous appearing insects, quail apparently eat any kinds they can catch on the surface of the ground or within jumping distance above it.

Young quail at first eat great numbers of very small insects, but turn more and more to a vegetable diet as they develop until at the age of three weeks to a month their diet becomes practically identical with that of their parents as far as proportions of vegetable and animal food is concerned. Two typical quail chicks examined by Mr. Charles O. Handley during the Quail Investigation will serve to show the kind and quantity of food consumed. One tiny chick about three or four days of age had 1 cricket, 4 locusts, 5 spiders, 2 bugs, 6 beetles, 1 ant and 3 grass seeds in the crop, as well as remains of 8 locusts, 5 grasshoppers, 32 beetles, and 24 grass seeds and 1 spurge seed in the gizzard. The crop of another around a week to ten days of age contained 32 beetles, 1 grasshopper fragment, 12 bugs, 15 spiders, 1 milliped, 2 fragments of caterpillars and 1 fly. It will be readily seen from these records that the quail families of Georgia and Florida farms consume tons of insects in the aggregate during the summer months.

Curiously the cock quail, who is a model of deferential behavior when in the company of his mate, will seldom or never eat an insect without first offering it to her; a wise provision of nature for upon her falls the main strain of the nesting season, for she may be called upon to lay several times her own weight in eggs (captive quail have laid up





to 139 in one season which shows their capacity), before bringing off a brood, if the first laid eggs are destroyed by natural enemies. Insects captured by the cock are pounded and mauled by him in a vigorous manner until dead and more or less dismembered, after which he dances about on tiptoe with puffed-out plumage and drooping wings, and in a scarcely audible undertone invites the hen to partake, which she does in a most matter-of-fact way. Even when the parent birds are accompanied by a brood of bright-eyed youngsters the mother shares with the chicks such offerings of the cock.

Quail at times do much good work on the farm by destroying serious insect pests. Where numerous in the vicinity they may keep small patches of Irish potatoes comparatively free of the destructive Colorado potato beetles, and they likewise do good through the destruction of pests that attack squashes, melons and other truck crops. It must be admitted, however, that they occasionally pick into strawberries, grapes and perhaps other small, low-growing fruits and vegetables in a way that proves slightly annoying, but the good they do many times offsets the harm, and they may be classed as a highly valuable ally of the farmer and truck gardener.

Fortunately for those attempting to increase or maintain quail for sporting purposes in the Southeast, there appears to be no necessity of attempting to artificially increase the animal food supply of these birds, for insects usually occur





in tremendous abundance in the sort of country they frequent. Their evident partiality for the vicinity of alfalfa, clover and other leguminous crops during the summer months may well be due to the insect life so abundant in such situations. Unfortunately, however, such fields all too frequently serve as natural traps, for many nests are destroyed by mowing machines when haying time arrives, and the loss of nests due to the several cuttings is a serious drain on quail numbers.



Quail Increase Versus Quail Mortality

NO one can have an intelligent understanding of the quail, or partridge, and its place in Nature's scheme, upon which to base effective measures to increase the numbers of these splendid game birds, without some knowledge of the causes contributing to the normal loss of eggs and growing young during the summer months, and of the adult birds throughout the year. A question asked more frequently than any other perhaps when quail are under discussion is "what becomes of the surplus?", for those with some knowledge of the quail's breeding potential and a taste for mathematics are mystified as to why these toothsome birds do not soon over-populate the earth. While quail are rightly considered to be prolific creatures, it may be well before going further to see just how prolific they really are. They are popularly supposed to bring off *two* or even *three* broods per year it is true, and it must be admitted that several things superficially point that way, which, however, have an entirely different explanation.

There is no question about their egg-producing capacity for captive quail hens have laid well over a hundred eggs during a single season (the record last year was 139 on the White Oak Quail Farm at Richmond, Virginia, and a South Georgia hen was not far behind with 136), and the





studies of the Co-operative Quail Investigation show that the quail in the wild may lay one set after another from May until September in their efforts to bring off a brood if the first nesting attempts fail due to egg-eating natural enemies, or to inclement weather conditions.

Believers in second or third broods point out the long nesting season and the frequency of young of two or three different sizes in the late summer coveys as proofs of their contention, while as a matter of fact the season is long due to the destruction of early nesting attempts, and the different sized young the result of the normal banding together of the surviving young from the hatches of different pairs as they come together in their wandering. This is perfectly clear to anyone who knows the length of the incubation period (23 days) and just how fast young quail grow, for the age differences represented in such combination coveys are usually considerably less than the incubation period alone. The fact that the cock or hen frequently appear in charge of a young brood *alone* may be likewise cited as proof that the cock and hen *each* rear a brood when the condition observed *may* be due to the activities of the observer's cat, which has caught and killed one or the other of the parent quail during the course of its nightly prowls.

The Quail Investigation made a special study of the matter of natural increase of the quail in the wild, studying the history of over six hundred nests in detail. As a result of this study it appears that the quail are very fortunate to



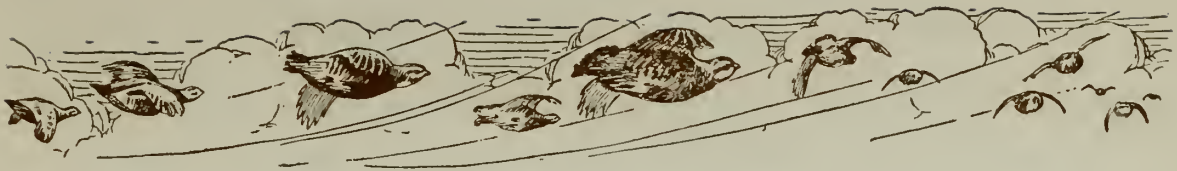


bring off even *one* brood considering the dangers among which they live, and that second broods are seldom if ever attempted if the first survive, for the rearing of one brood successfully seems to completely satisfy their nesting instincts.

As the average set of eggs in the wild proved to be between fourteen and fifteen and the average hatch about 86 per cent. it is evident that approximately twelve chicks start out into the world with the average successful pair.

It is only necessary, of course, to maintain a stationary population that a pair be present each spring to replace a breeding pair of the preceding spring; it makes no difference whether this pair be old birds that have survived the many dangers to which they are exposed, or young entering their first nesting season. In other words only enough of the thousands of young quail hatched each year need to survive to replace the old birds that meet death from various causes; all the rest can be shot, killed by natural enemies or accidents, and so forth without permanently affecting the level of quail abundance. If the quail in your neighborhood are declining in numbers while both food supply and cover remain favorable, it is evident that too many in the aggregate are being killed, while if the contrary be true it may be safely assumed that the various causes of quail mortality are not fully absorbing the annual increase. For these reasons people interested in the quail crop of their farms should watch the stock on their ground closely, for it is no more





possible to raise a crop of quail without an ample breeding stock than to raise a crop of cotton or corn without seed. Likewise there is no more logical and effective method of increasing quail in favorable quail country than to assure the birds a measure of protection from their most destructive natural enemies, thus throwing the balance in their favor. To do this it is necessary to know what their enemies are and how to control them.

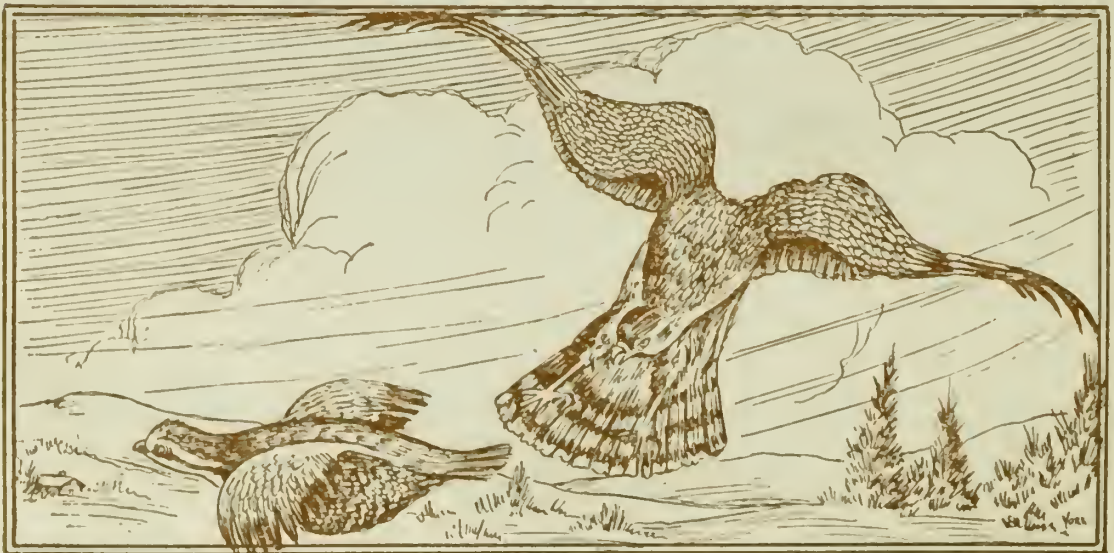
The losses caused by bird, mammal, reptile and other quail enemies, and by the elements, diseases and so forth will be discussed in further articles of the series. Some of these losses, such as those caused by floods, storms and other elemental causes must be accepted as inevitable, while others, such as those caused by half-wild house cats or famished cur dogs that range the game fields without restraint can, and must be, controlled if quail and other attractive birds are to thrive.



Bird Enemies of the Quail

IN the last article we discussed the tremendous reproductive power that Nature has provided the quail, or partridge, to offset the loss of eggs, young and mature birds caused by their host of natural enemies, for it seems that every creature of tooth, talon and claw has been likewise provided with an appetite best satisfied by the flesh of the quail or their eggs. In this article we will confine ourselves to the bird enemies of quail, leaving the others for later discussion.

In considering bird enemies of these game birds one naturally thinks first of hawks and owls, and many assume that if these were all killed off the quail would thrive. This is far from the truth, however, for many of these birds are actually beneficial rather than harmful to quail interests as a rule, thanks to their wholesale destruction of creatures that eat quail or quail eggs. For instance there is ample scientific basis for classing Red-tailed, Red-shouldered and Marsh Hawks as mainly beneficial, for all are eaters of snakes, rodents and others that prey on quail to an extent that more than off-sets the damage the hawks themselves do to these game birds. If one of these hawks destroys fifty cotton rats, a dozen or two egg-eating snakes and an occasional young opossum or skunk during the course of the year, we can overlook the half dozen quail caught also during this





period, especially as there is a likelihood that the majority of the game birds caught by these slow, soaring hawks are wounded, diseased, or otherwise defective individuals that react slowly to danger.

The handsome little Sparrow Hawk is mainly a grasshopper eater, while the unsuspicious Broad-winged Hawk is entirely beneficial to game and agricultural interests, although often shot due to a slight resemblance to the murderous Cooper's Hawk.

Although we can give the bulk of the hawk tribe a clean bill of health in a general way we cannot do it with all, for the Cooper's and Sharp-shinned Hawks, fast-flying, bird-killing species commonly known as "blue darters" or "blue-tails," may be rightly classed as the most destructive of all known quail enemies with the possible exception of man himself, who may be their greatest friend as well. Quail are terrified whenever a "blue darter" appears, and if pursued are doomed unless there is a briar patch, grape vine tangle or similar refuge close at hand into which they can escape, for these hawks hunt them persistently and often during their 365-day open season. Quail and other beneficial birds are greatly benefited through a reduction in the numbers of these arch destroyers which should be shot at every opportunity, and the nests searched out and the parent birds killed during the early spring months. This is easier said than done, unfortunately, for "blue darters" may become exceedingly wary after a career in chicken thievery.





As a general rule the smaller fast-flying hawks are the ones to kill, while the more conspicuous hawks, and those of soaring flight can well be spared unless individuals become destructive at the poultry yard, as those of any kind may occasionally do. The best way is to learn to distinguish the good kinds from the bad.

It is worse than useless to kill owls as a measure of quail protection, for even the largest kinds kill no more than an occasional quail that has been flushed from the roost by prowling foxes or cats, due to the fact that they hunt largely by sound and motion, and ordinarily prey on creatures active like themselves during the night time, or that roost in conspicuous places. All of the larger owls do much good as well through the killing of rodents and the young of skunks, opossums and other creatures that prey to a greater or lesser degree upon quail or their eggs. If wild turkeys are being preserved, however, the Great Horned Owl may well be shot as opportunity presents for they are destructive to turkeys and chickens, though partly beneficial through their destruction of rats and skunks. Any of the larger owls may become destructive where game birds are being reared artificially in open-topped pens, and require control.

As is well known crows are great lovers of eggs of all kinds and may become destructive to quail where they are very numerous, and nesting cover for the quail scant and open. Due to the damage they do to crops, however, farmers seldom have to be encouraged to shoot crows, which





know only too well how to take care of themselves. It might be well to point out, however, that the warfare against crows is only of benefit to quail of the vicinity if carried on during the summer months while game birds are nesting, for crows wander widely during the winter and those present at that time may nest in distant regions.

In conclusion a few remarks on the relation of domestic poultry to quail may not be amiss. Wide ranging turkeys, chickens and other domestic birds may become a serious menace to quail in a variety of ways. Turkeys are very fond of quail eggs, and few nests escape their sharp eyes, while chickens destroy nests on occasion. Quail are also very susceptible to poultry diseases and parasites, which are spread far and wide by free-ranging domestic birds. Even worse is the practice of spreading poultry manure over the fields for fertilizer, for the game birds may become seriously infected.

There are a few other birds such as shrikes ("butcher birds") and blue jays that may molest quail or their eggs under exceptional conditions, but the damage they do is as a rule too insignificant for consideration. A reduction in the number of "blue darters," and of crows where numerous, as well as reasonable control of poultry wanderings may be considered as matters of primary importance where quail are desired in abundance, however, and are worthy of serious attention, for quail thrive best where their handicaps are few.



Mammal Enemies of the Quail

IN our last article we discussed the bird enemies of quail, pointing out that some, like the "blue darter" hawks, prey extensively on the young and mature birds, others like crows and jays eat the eggs or molest newly hatched young under certain conditions, while domestic poultry harbor diseases and parasites that prove deadly if transmitted to the game birds. In the present article we will limit the discussion to the various mammal enemies, many of which are extremely destructive, and all more or less subject to control where an increase of quail and other attractive bird-life is desired.

Among mammals, few are more destructive to quail than house cats and free ranging dogs. Practically all cats are natural born hunters, catching quail and other birds on their nests or roosts during their nightly prowls. While cats do not have a highly developed sense of smell to aid them in locating their game, their hearing is remarkably acute and they destroy many brooding quail just at the hatching time, being attracted by the faint cheeping of the still confined chicks. While not as a rule so destructive as cats, many dogs are confirmed egg eaters, and such may prove tremendously destructive to game birds if permitted to roam the fields during the nesting months. Both cats





and dogs may cause much harm, also by scattering young quail broods during wet or chilly weather.

Skunks (two kinds, the little spotted skunk, or "civet", and the large striped skunk, or "polecat"), opossums, foxes, raccoons, weasels and other common furbearers are all more or less destructive to quail or their nests. Studies of the Co-operative Quail Investigation revealed that skunks alone destroyed from one-fourth to one-tenth of all quail nests under observation in certain areas, the little spotted skunk being the worst offender in this respect, having an uncanny ability to locate quail nests. As skunks bite off one side of the egg and lick out the contents, leaving the shells more or less together in front of the rifled nest, their work is easily recognized afield, although often laid to crows by the uninformed.

The opossum is likewise very destructive, eating quail, eggs, shell and all, but like the skunk, is not active enough to prey on the quail themselves to a serious extent. As they are extremely prolific, and range over the uplands as well as around the branches, they run across and destroy many quail nests during the course of a season. The raccoon is as fond of eggs as the opossum but causes less trouble because they range mainly along water courses rather than in the uplands where quail normally nest. The high prices of raccoon fur has been responsible for a great reduction in the numbers of these interesting and amusing creatures dur-





ing recent years, and they do not deserve further persecution on the grounds of quail preservation.

The status of the fox (gray foxes are found all over Florida and Georgia, while the red is seldom found south of Middle Georgia) in relation to quail has been the subject of much heated controversy during recent years, the fox hunting devotees frequently contending that foxes live largely on injurious rodents and do not molest game birds, while the bird hunters accuse the fox of being the most destructive of all quail enemies. The truth of the matter probably lies somewhere between these two extremes, the foxes preying largely on rodents when they are plentiful and available, but turning to quail and other birds when rodents become scarce. Unfortunately, no adequate studies of the diet of foxes at all ages and seasons, and under varying conditions have yet been made. While they are positively known to destroy some quail and other game birds, this may be largely offset by the field rats and other rodents they eat. In view of their known tastes, however, it would seem only the part of wisdom to keep foxes down as much as possible on lands where quail are desired in abundance, but to tolerate them in limited numbers where they are highly regarded as game animals. The question is an important one, for foxes appear to be on the increase over much of the Southeast at the present time.

Weasels are active, blood-thirsty little creatures which may prove destructive to quail where numerous, but this is





fortunately seldom the case in either Georgia or Florida. Like foxes, weasels are great destroyers of cotton rats and other rodents, doing some good in this respect to offset the harm they do.

Last, but not least, of the animals to be discussed are cotton rats, or "field rats," rodents that increase until they become exceedingly abundant in the broom sedge fields of the South, only to disappear almost completely through the agency of some undetermined disease that has occurred at intervals of four or five years. When and where excessively abundant, cotton rats prove destructive to quail eggs, compete with these birds for some of their favorite foods, and worse, serve as an attraction to skunks, opossums, foxes, weasels, house cats and egg-eating snakes that destroy many quail nests incidentally while hunting the rats.

While cotton rats can be easily trapped or poisoned (and die off periodically in any case), the best way to control their numbers is through removal of their favored cover. As pointed out previously, old dense broom sedge has no place on well handled quail lands, but is a haven for the rats. If the cover is kept thin and open, either by rotation of cultivation or late winter burning, cotton rats will give little trouble.

If opossums and raccoons are kept reduced in numbers through the good old Southern sport of 'possum hunting, foxes, skunks and weasels hunted or trapped closely for their furs, house cats and mongrel dogs properly attended to by





their owners, and cotton rats largely eliminated through removal of the cover they frequent, quail will have a chance to rear large, early broods and produce an annual surplus that can be legitimately harvested by man if desired. No one can fully appreciate the loss of eggs and young quail caused by the activities of natural enemies unless they have followed the history of many nests from the time the first eggs are laid until the young birds hatch some forty days later, but it is appalling in any case, and must be appreciated to be corrected. Of course correction is unnecessary unless quail are desired in abundance for sporting purposes, for such destruction has been part of Nature's scheme for ages.



Reptile Enemies of Quail

IN the two preceding articles of this series we discussed the bird and mammal enemies of quail respectively; in this we will confine ourselves to the reptiles known to eat either the quail or their eggs.

In following the history of a large number of quail nests afield, it will invariably be noted that a considerable percentage have all or part of the eggs removed in a mysterious manner, the nests being in no way disarranged and no evidence left by the robber. While several of the mammals previously discussed such as raccoons, opossums and dogs eat quail eggs, shell and all, these creatures are apt to scratch out the nest or otherwise disarrange it, or leave some evidence of their visit. If the eggs have been removed without any disturbance of the nest or its surroundings, the work can only be that of a hungry human being or a snake, usually the latter, for the practice formerly prevalent among negroes of the South of gathering quail eggs to eat is rapidly dying out. If two or three eggs are disappearing at intervals of a day or two the robber is probably a snake too small to swallow all the eggs at a single visit, which the largest snakes can do with ease.

The studies of the Co-operative Quail Investigation revealed that comparatively few common Southeastern snakes





are seriously destructive to quail or their eggs, and that all of these do some good to offset the harm done to game birds. Unfortunately for a satisfactory discussion of the subject, there is considerable confusion in the common names of snakes but the names used here are those in general use in the region. The snakes that are eaters of quail or quail eggs are in general the same kinds that are known to prey on rodents, and include the racers (blacksnake, coachwhip and indigo snake), and the colubers ("rat snakes" and "chicken snakes"), as distinguished from a large number of species that prey largely or entirely on frogs, fishes and other cold-blooded creatures.

While the relative destructiveness to quail of the various species known to eat the birds or their eggs is almost impossible to determine, it seems certain that the common coachwhip, an exceedingly long, slender and active reptile of yellowish-brown coloration, is the most destructive of any Southeastern snake, for it preys extensively on the young quail as well as on the eggs. The common blacksnake, another true racer, eats both eggs and young quail on occasion, but fortunately blacksnakes usually retire to the vicinity of water during the summer months for an easily obtained diet of frogs, not frequenting the uplands where quail nest as persistently as the coachwhip. A third racer, the shiny blue-black indigo snake, which reaches a length of eight feet, also eats birds and bird eggs to a certain extent, and





is presumably somewhat destructive to quail, but this large showy reptile is not of general distribution.

The colubers include many snakes usually referred to as "rat snakes," or "chicken snakes," and so far as known all eat birds and eggs on occasion, as well as various rodents. The beautifully marked red coluber, "corn snake," or "red chicken snake," preys to a certain extent on quail, as does the grey coluber, more appropriately known as "white oak runner," due to its persistent climbing about in oak trees; very large examples of the former have been known to swallow mature quail. The pine snake, also called "bull snake," or "white gopher snake," a large light-colored reptile largely confined to dry pine barrens, is fond of the eggs of quail and other ground nesting birds, as is the common king snake. The latter, however, is cannibalistic, offsetting the harm done to quail by eating many snakes that are also destructive to these game birds. Large rattlesnakes kill and swallow even mature quail on occasion, but are not known to eat eggs, and are seldom numerous enough to be very destructive. Ordinarily, they prey largely on rabbits, cotton rats and other rodents.

Water snakes, garter snakes, grass snakes, "blow snakes," or "spreading adders" and the numerous smaller species of snakes are in no way harmful to quail or other bird life so far as known.

Even on a quail preserve, where every effort is made





to protect the game birds from their enemies, destructive snakes prove exceptionally difficult to reduce in numbers, the most effective method known being the payment of small bounties to tenant farmers living on the ground, for killing the most harmful kinds. In general, a most effective control consists of the suppression of old, dense broom sedge either through occasional cultivation of the land, or burning in the late winter. This removes the cover essential to cotton rats and other rodents which attract snakes in numbers, and is, as previously pointed out unfavorable to quail for several reasons. Many egg-eating snakes can be destroyed by noting the calls of the mischievous blue jays, which locate and "mob" snakes. This is particularly true in the case of the "white oak runners," which are enemies of tree nesting birds as well as quail and others that build on the ground. The writer has located a half dozen or more of these snakes in a single day by listening to the jay calls.

There is a general belief over much of the Southeast that the common box turtle or "land terrapin" is an eater of quail eggs. While there may be some truth in the accusation, experiments with many captive individuals and the study of over six hundred quail nests afield in country where these creatures occur has failed to reveal any basis for the belief, and these innocent and highly interesting creatures may well be left to go their way unmolested.

While landowners and others interested in quail increase can help these game birds greatly by reducing the numbers





of snakes listed as destructive to quail, it goes against the grain to destroy more than necessary of creatures that are of such assistance in the general warfare against rodents. Where control work is necessary it may well be confined to snakes of proven destructiveness, and to grounds where an abundance of quail is of primary importance.

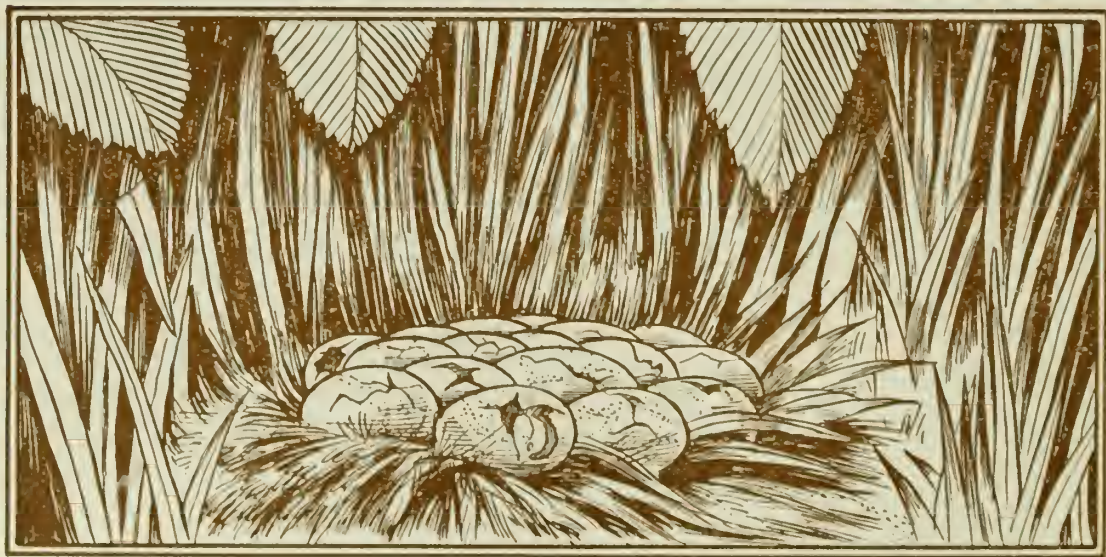


Miscellaneous Causes of Quail Loss

IN the three preceding articles of this series we discussed predatory birds, mammals and reptiles as enemies of quail and suggested means of reducing the numbers of the most destructive as a measure of quail preservation, on lands where the game birds are desired in sporting abundance. In this article we will discuss a few additional causes of quail mortality that do not lend themselves so readily to control, and must be accepted as largely inevitable.

The most pitiable and one of the most serious causes of quail destruction encountered during the field work of the Co-operative Quail Investigation is caused by small red ants, known as "thief ants" (scientifically as *Solenopsis molesta*), which may occur in tremendous numbers in open broom sedge fields or fallow lands, the best type of quail nesting grounds. Unfortunately also, the ants are usually most numerous along paths, roads and around field borders where the majority of quail nest.

While ants invade quail nests during the absences of the owner, and try to bite their way through the shells of the eggs, they are not known to be successful in this form of attack, and upon returning to the nest the quail may devote considerable time to picking off and eating the ants, and will keep the nest clear of them where not too numerous.





Occasionally they bite and annoy an incubating quail until the bird deserts the nest, to set up housekeeping in a more comfortable location. The main loss from these pests, however, takes place just at the hatching time, when the young bird has "pipped" the shell and started the opening through which to emerge. Into this opening the ants swarm and literally consume the poor chick alive, and young quail are extremely tenacious to life at this stage of their development. Mr. Louis B. Campbell and the writer have encountered dozens of instances where this destruction of the baby quail was just taking place. A description of these experiences would not make pleasant reading, nor would it be believed by the sentimental person with little knowledge of natural processes but the firm conviction that all is beautiful in the lives of Nature's children.

Comparatively little is yet known about the general distribution of "thief ants" and the factors that govern their abundance. Some seasons they are not numerous enough to cause serious losses among hatching quail, while during others they are so excessively abundant on certain lands that few quail can leave the egg successfully. They seem to thrive on clay soils, or on sandy soils where their tunnels can penetrate the clay beneath. They are a serious menace to nesting quail this year in parts of the Thomasville, Georgia-Tallahassee, Florida, region and may be as destructive over wide areas of the Southeast for all we know to the contrary. For this reason, if for no other, those interested





in quail should make a point of following the history of as many nests as can be located, to check up on this matter. Whether present ant abundance has any relation to the heat and drought is uncertain, for our ignorance of such matters is profound.

While there is no known method of combating ants successfully over large areas of land, some quail can be saved in heavily infested areas by treating all the ant hills within fifty feet or so of such quail nests as can be found. Kerosene, carbon disulphide (a highly explosive chemical that should only be used with extreme caution), or such commercial preparations as Flea Compound Rosin Oil, squirted down the ant holes with a long snouted oil can of the type used by locomotive engineers, has proven satisfactory in practice, although it is usually necessary to go over the ground several times to make sure that no ants survive. While few people will be in a position to save many quail by such means, it is a great satisfaction to save even one nestful of the attractive youngsters from such a horrible death. After witnessing the destruction by ants, of a hatching quail brood or two, many sportsmen and bird lovers will feel impelled to save as many of the quail in their vicinity from such a fate as possible.

The weather during the breeding months has, of course, a great deal to do with quail abundance. Severe heat and drought, such as is being experienced over much of the Southeast at the present time (June-July), is causing a





considerable spoilage of quail eggs in exposed nests in open fields, for these eggs require moisture for the embryos to develop normally. On the other hand, torrential rains may wash dirt and mud onto eggs, or break in the roof of nests, either of which may cause desertion, while very young chicks caught in ditches, extensive flats, or low lands are frequently drowned. Hail may break eggs or kill chicks, or the latter may perish if scattered by natural enemies during wet, cold nights. As is to be expected, the *average* season, or one a little dryer than the average in this latitude proves the most favorable for quail reproduction, while wide departures from the normal are unfavorable in varying degree.

Losses caused by the elements must usually be accepted as inevitable, though some things can be foreseen and corrected where people are sufficiently interested. For instance, when carrying on necessary burning in late winter to keep the ground growth open and in proper condition for quail, grassy spots are often skipped in wet depressions, that later dry out and become natural traps for such quail as may attempt to nest in them. The remedy is, of course, to burn over or otherwise destroy nesting cover in areas subject to flood, meanwhile maintaining plenty of suitable nesting cover on the uplands.

Among miscellaneous causes of quail destruction of minor importance may be mentioned fast traveling automobiles, which cause the death of some quail and many other creatures on our highways, wire fences and similar man-made





obstructions of low visibility which birds may strike in their flight (some quail are killed by flying full tilt into white buildings which they apparently do not see), and a multitude of other things which are individually of small importance, but which take a considerable toll in the aggregate. The quail shot by man in legitimate sport and the possible losses from disease and parasites will be discussed later.



Parasites of Quail

IN preceding articles of this series we have discussed the losses of quail caused by bird, mammal, reptile and miscellaneous enemies, and by the elements; in this we will discuss internal and external parasites that live at the expense of these game birds, and either endanger or annoy them.

Anyone having the opportunity to examine closely large numbers of Southeastern quail, either alive or dead, during the winter months when they can be legally hunted, will probably be impressed with their uniformly fine condition and apparent freedom from disease or harmful parasites; hundreds may be examined at times without a single defective individual being found. But it must be remembered that harmful parasitism is more to be expected during the warmer months when the ground vegetation effectively conceals the game birds, as well as any minor losses among them.

Quail normally harbor several kinds of lice which usually occur in small numbers only, and which apparently cause the birds no harm, though possibly some annoyance. Occasionally a weak bird will be found fairly swarming with lice, but these have probably increased due to a lack of bodily vigor which made it impossible for the bird to successfully combat them, and they may be in no way responsible for the condition of their host. An occasional quail is also found in-





fested with extremely small, dark colored mites which normally remain upon their host, differing in this respect from the well-known chicken mite, which hides about the roosting spot by day but visits the sleeping fowl by night to feed. Mites presumed to have been of the above species have been reported to cause the death of quail in one Alabama locality during long continued wet weather, but we have no definite knowledge of this.

Among external parasites the most serious in their effect on the quail are undoubtedly ticks and "red bugs," or "chiggers," both of which are frequently found on these game birds, and which cause them much annoyance (they may transmit such diseases as tularemia, as will be later pointed out). The ticks found on quail are usually the immature stages commonly known as "seed ticks," of the rabbit tick, although several other kinds have been found upon them. Over a hundred engorged ticks have been found on several occasions in late summer, attached to the head of a single half-grown quail. Sometimes their bites cause swelling around the point of attachment; more frequently no inflammation is noted. The same is true of "chiggers" which may be found attached without any noticeable swelling, or again in numbers on the outer edges of a crater-like sore spot, usually on the bare skin between the feather tracts of the bird's lower parts. Although we must consider both ticks and "chiggers" as potentially dangerous enemies of growing quail during the summer months, at times, and under





certain conditions, we do not know of quail being actually killed by them.

Quail delight to wallow in the soft dry dirt of field borders or around old burned logs and stumps, presumably to relieve themselves of lice and perhaps other external parasites, and the birds will occasionally pick ticks from the heads of their covey companions.

Quail are also subject to infection from many intestinal parasites such as tapeworms and roundworms, only a few of which can be even mentioned here. While some kinds appear practically harmless to them, others cause much trouble where quail are being artificially propagated and may at times cause some loss in the wild. Most of the more harmful intestinal parasites of quail are acquired through contact with infected poultry, which may be a real menace to the game birds in thickly settled country where poultry run at large, or where the quail habitually venture into door-yards after mulberries or other food. For instance, of five kinds of tapeworms known to infest quail of the Southeast, four are common parasites of chickens, and are found in the game birds only on lands where they come in contact with infected poultry; one only being found in quail from unsettled regions. Three of the four chicken tapeworms cause serious losses at times where quail are being artificially reared with bantam foster mothers.

None of the dozen or more species of roundworms found





in Southeastern quail are known to be serious enemies of the wild birds, although some cause losses locally under exceptional conditions. One minute hairlike roundworm difficult to even see with the naked eye (known to science as *Trichostrongylus pergracilis*,) has been found in nearly half of the wild quail examined by the writer from the Southeast. This parasite must be considered potentially dangerous, for the same species when very numerous is responsible for the "grouse disease" which at times ravishes the grouse moors of the British Isles.

Malaria has been detected in mature quail in Spring, but studies have not progressed far enough to make clear how prevalent it is, or whether it is in any way comparable in its effects to human malaria. Quail are also subject to two other diseases caused by Protozoan parasites, Coccidiosis and blackhead, but these will be discussed later in the article devoted to quail diseases.

Sportsmen and others interested in quail should be ever on the alert to detect any serious diseases or parasitic infections affecting their favorite game birds, and bring the same to the attention of their State Game Commissions, so that the condition can be referred to, and studied, by competent specialists.

The plowing, or occasional burning over of the bulk of the Southeastern quail range, probably greatly lessens the danger of quail becoming infected with parasites and dis-





eases, for both are effective sterilizing agencies. Poultry manure, as previously mentioned, should never be spread for fertilizer over lands where quail are desired in abundance due to the danger of infecting the game birds with dangerous poultry diseases and parasites, and poultry should be confined as far as practicable for the same reason. These are all measures that can be applied by the ordinary farmer or landowner who is trying to increase quail on his holdings by improving food supply and cover, controlling natural enemies and so forth, and if properly attended to he should have no cause to worry about quail diseases and parasites. A knowledge of the life history of dangerous parasites and how to combat them is, however, vitally necessary to those attempting to artificially propagate these game birds in large numbers.



Diseases of Quail

AS MENTIONED in the preceding article of this series, wild quail appear to be largely free of disease during the winter months under conditions at present prevailing in Georgia and Florida, and hundreds may be examined at times without defective individuals being noted. Due to the heavy growth of ground cover during the summer months the case is not so clear, for a considerable loss of quail from disease might easily go unnoticed. As we know comparatively little as yet about quail diseases in the wild, we will largely confine this discussion to disease that give trouble where quail are being artificially propagated, and that may be expected in the wild birds under exceptional conditions.

"Quail Disease." Quail held in captivity in crowded quarters or under unsanitary conditions, as those imported from Mexico to restock depleted areas, are frequently afflicted with an intestinal disorder which causes heavy losses. As this so-called "quail disease" ordinarily gives little trouble even in captivity where the birds have clean range, and is not known to occur at all among wild birds, it is assumed to be caused by crowding and unsanitary conditions. So far as known the disease will not spread among the wild quail even when infected quail are released in the coverts, the





latter either dying or soon recovering after they get on clean ground. Examination of quail that have died of this disorder reveals ulceration of the intestines below the gizzard.

Coccidiosis. In quail, Coccidiosis seems to be almost entirely a disease of infancy, the presence of Coccidia in the intestinal tract of birds over two to three months of age not appreciably affecting their general condition. In fact, from twenty-five to fifty per cent of the adult quail examined during the Cooperative Quail Investigation from the Southeastern States showed varying numbers of Coccidia. In spite of this, and the known susceptibility of the young birds, we have no evidence indicating that quail chicks die of Coccidiosis in the wild under normal conditions, though a few may be so lost without the fact being recognized. Probably the comparative freedom from this disease during the danger period is due to their wide, clean range and the way they move around upon it, seldom lingering in any one place more than a day or two.

Under the crowded conditions of captivity, however, Coccidiosis may cause severe losses of young quail, and it has been regarded in the past as the most serious stumbling block in the artificial rearing of these game birds. The only means of combatting the disease known consists of rigid sanitation and an abundance of pen room.

Blackhead. The disease known as blackhead is, like Coccidiosis, caused by a Protozoan parasite of the intestinal





tract. It is a serious disease of turkeys to which chickens have a high resistance, although they may act as carriers. While an occasional quail is lost in captivity from this disease, it has not been recorded from the wild birds, and quail, fortunately, do not appear to be very susceptible to it. Examination of quail dying from blackhead usually reveals a spotted liver, and the lower intestine more or less grown together in a solid mass.

"Sorehead," or *chicken pox*. Quail are very susceptible to "sorehead," a disease common in poultry flocks of the Southeast. Occasionally wild quail are reported as suffering from this malady in settled districts, presumably having acquired it through contact with infected chickens. The eyes of quail suffering from this disease become very much swollen, the birds being blinded by cheesy growths over the eyeballs, and soon starving through inability to find food. There are several diseases of this general group (including roup, influenza, common colds, etc.), similarly affecting the eyes of the birds in some degree. Those interested in the increase of quail and other upland game birds can do much to prevent the spread of such diseases by restricting the range of their chickens, and avoiding the use of poultry manure to fertilize their fields.

Nutritional roup. This is a deficiency disease that has caused the loss of great numbers of quail in captivity, especially in the earlier days of artificial propagation, before the importance of an adequate supply of green food of a kind





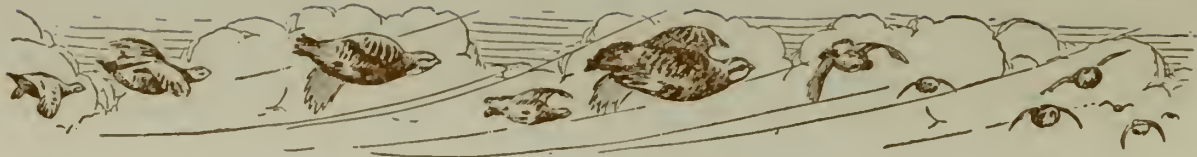
relished by the birds was generally recognized. It is difficult to distinguish nutritional roup in the living bird from "sore-head," for the eyes are similarly swollen and blinded as a rule. Examination of quail that have died from this malady reveals a whitish wash, or deposit, all over the heart, kidneys and other internal organs.

As this is a deficiency disease, caused by lack of sufficient green food of proper quality in the diet, the remedy is obvious, and wild birds may only be expected to acquire it under very exceptional conditions.

Aspergillosis. This is a disease of the respiratory system caused by breathing in the spores of a common fungus of mouldy grain or litter, and may be expected occasionally in an individual quail either in captivity or in the wild. Quite frequently it is evidenced by a cheesy growth in the wind-pipe, or trachea.

Tularemia. While no cases of tularemia, or "rabbit disease" are positively known in quail of Georgia or Florida, a careful lookout should be kept for it by all who are interested in these birds, for the reason that rabbits are known to die of it, and experimental infections have demonstrated that quail are very susceptible, while a known transmitting agent in the form of the rabbit tick occurs commonly both on quail and rabbits. That it may occur among quail at times is indicated by a leaflet published by the Public Health Service implicating these game birds in two human





cases of the disease in the Southeast, though neither case was entirely clear.

Captive quail are known to be susceptible to several additional diseases, while wild quail may have malaria, as mentioned in the preceding article of this series. Everything indicates, however, that the wild birds are singularly healthy as a rule, under conditions at present prevailing in the Southeast, where their range is ordinarily either plowed up or burned over at more or less frequent intervals. The fact quail do not ordinarily concentrate on certain favored portions of their range, as certain other game birds are prone to do, assists also in keeping them free of harmful parasites and diseases. Everyone interested in these fine game birds should, however, be on the alert to detect anything in the nature of disease among them, so that the State Game Commission can be notified, and competent investigators detailed to study the condition. Only by such means can more be learned about the diseases of our game birds, and how to combat them.



Movements of Banded Quail, or Partridges

FEW LANDOWNERS care to go to the trouble and expense of planting food and cover, and protecting from enemies, a game bird that may be expected to move off onto other property as soon as reared, where others will reap the reward of their labors. While most observant farmers and sportsmen are of the opinion that the quail or partridge remains close to the point where reared, there has been much difference of opinion on the subject, some contending that although these birds were not truly migratory, nevertheless they made seasonal movements of considerable extent.

To determine the extent of the covey range, the movements of individual quail upon it, and to secure other information obtainable only in this way, the Cooperative Quail Investigation trapped about twenty-four hundred wild quail in their natural range and banded them with the aluminum bands furnished by the U. S. Biological Survey. Each band is individually numbered and the numbers are never duplicated, and the bands will remain in place for the lifetime of the bird without in any way hampering its movements. Approximately 250 of the quail so marked were shot during subsequent hunting seasons and the exact locations reported; about 200 more were retrapped by the investigators after sufficient time had elapsed to make the record of interest





and value. A few of the banded birds were retrapped a dozen or more times in the four following years.

While it is not claimed that quail behave everywhere exactly as they do in the Thomasville, Georgia-Tallahassee, Florida region where this study was made, nevertheless it may be considered a representative sample of the behavior of southeastern quail in largely agricultural country.

An interesting point brought to light by the banding work, is the short "life expectation" (to use a common life insurance term) of wild quail living in a state of nature. While a very few were retrapped or shot up to four years after marking, such long-lived quail seem as exceptional as the human being of a hundred years; the great majority retaken being secured within the first year following banding. A much smaller number were secured the second year, and only an occasional individual up to the fourth year. While some of these quail were banded as young birds in Fall, most were marked in Spring immediately after the close of the shooting season.

Only about two and a half per cent of the banded quail recovered had made journeys of three miles or over (one hen had moved eight miles, the farthest recorded) and both sexes were represented among these travellers. Only about half of them were retaken over a half mile from the point of banding, while the great majority were recovered within the mile of banding. Two banded cocks were of special





interest, being retrapped again and again within a mile or less of the original location during the four years following marking. While they were always recaught in various places within this mile, both of course may have wandered at times slightly beyond its confines.

Apparently in cases where their range is deficient in food supply or cover necessary to their survival through the winter months, an occasional covey of quail moves together in late Fall two, or even three miles, from their rearing ground. Such a Fall "shuffle" is said to be rather general in some portions of the quail's vast range in eastern North America; it is apparently very exceptional in southeastern agricultural country of abundant food and cover. In country of the "flatwoods" type, however, quail reared in barren pine uplands frequently move for the winter to the vicinity of "branches" or water courses, where a varied diet of acorns and other "mast" is obtainable, such movements probably seldom taking the birds more than a mile or two.

Due to unequal numbers of cocks and hens in many coveys, the surplus of cocks that occur in most regions (the usual sex ratio is about 120 cocks to 100 hens at the beginning of the nesting season), and for other reasons, there is more or less shifting about of both sexes at the mating time in Spring, but these movements apparently seldom take the birds over a mile from where they were reared. This Spring "shuffle" mixes the stock thoroughly on normally stocked





range, removing all likelihood of the "inbreeding" so feared by many sportsmen.

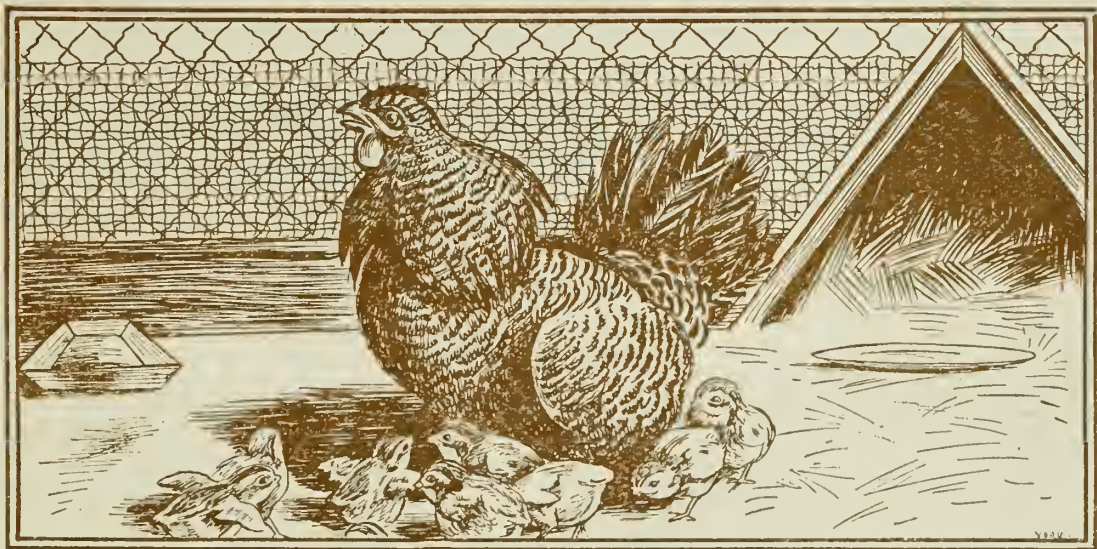
From the standpoint of remaining upon their range of a mile or less it will be seen that the quail is a logical by-product of the farm and in every way worthy of the attention of the farmer. While most of the annual increase may be expected to remain upon his land in any case, this is of course particularly true of the larger holdings, for the larger the place the smaller the proportion that will range back and forth across the outside boundaries. Due to their generally sedentary habits, quail, like rabbits and squirrels, are classed as "farm game," and best results in the development of this farm resource will be secured through the co-operative effort of farmer groups with a large combined acreage. Sportsmen desiring the best shooting of such "farm game" will ultimately have to secure it through arrangement with the land-owning producers, who must be recompensed in some way as an inducement to production.



Artificial Propagation of Quail

DURING recent years a great deal of interest has developed in the artificial propagation of quail and a few individuals have reared these highly regarded game birds in considerable numbers, the most successful being Mr. W. B. Coleman of Richmond, Virginia, who has done more than any other man in the development of methods for rearing them in confinement. At the present time at least twenty thousand quail are being reared annually in captivity in the United States, perhaps considerably more, but no exact figures are available. Until very recently practically all of the quail so reared have been for the purpose of release on private hunting preserves, or produced on State Game Farms, as in Virginia, to restock coverts depleted through public shooting and other causes. Recently a few commercial quail breeders have entered the field.

One of the first methods used in quail rearing was the so-called "bantam system" in which eggs produced by captive quail are incubated and hatched by bantam hens, who also act as foster mothers to the young quail until they reach an age of six or eight weeks, when they are ready for release afield. The most serious disadvantage of this system is due to the fact that many bantams are infected with diseases or parasites that prove deadly when transmitted to the quail, and transmission is frequently difficult to avoid





under the crowded conditions of captivity. For this reason the system has been largely abandoned in Georgia and Florida, though still extensively used from North Carolina northward, less trouble having been encountered where freezing winter temperatures prevail.

A modification of the bantam system has been used with considerable success on the hunting preserves of North Florida and South Georgia, the bantams being used for hatching purposes only, and the young quail taken from them as soon as hatched and reared with the use of small kerosene-burning brooders, or with cock quail foster parents which have been trapped up afield for the purpose. This latter method is, of course, only practicable where there is a considerable surplus of cock quail available. The only serious difficulty experienced with the use of cock quail in rearing has been due to the transmission of *Coccidia*, microscopic intestinal parasites harmless to mature quail, but producing the disease known as *Coccidiosis* in the highly susceptible young birds. Where rigid sanitation is employed, however, this has proved a comparatively successful method, and it is very interesting to work with, for cock quail almost invariably adopt chicks under proper conditions, and "mother" them in a most efficient manner.

Some more or less successful quail breeders have used various types of oil-burning incubators for hatching, and oil-burning brooders for rearing, while the latest development of all consists of the hatching of quail eggs in electrically





heated incubators and rearing the chicks on elevated wire-bottomed runs with electrically heated brooder units, the pioneer experiments in this line, as in the bantam system, being carried on by Mr. W. B. Coleman.

Although methods of hatching and rearing differ widely, and new and better methods are constantly being developed, the production of quail eggs seems to be largely standardized, pairs of quail as a rule being confined in runs about five by ten feet in size, where many eggs are usually laid if the birds are properly fed and cared for. Tame hand-reared quail hens have frequently produced an average of over sixty eggs each during the season; a very few have been known to lay over one hundred and thirty.

Thus it will be seen that the artificial propagation of quail is still in a period of rapid development, but progress being made warrants the belief that ultimately quail, like ring-neck pheasants, will be produced in tremendous numbers for sporting purposes. In spite of this encouraging outlook, however, the fact remains that this work is still a somewhat uncertain and very expensive business, and few have yet succeeded in rearing good sound birds in quantity for less than two to four dollars each. This high cost is due to the large amount and kind of equipment that seems essential, and to the amount of labor required in properly caring for the birds. As new and better methods are developed and knowledge increases as to how to combat parasites and diseases, this high cost will undoubtedly be reduced.





With imported Mexican quail available in large numbers for around two dollars each, laws in many states that discourage rather than encourage the sale and interstate shipment of even artificially reared quail, and the constant danger of large losses from disease even under systems of rigid sanitation, it is no wonder that there are yet so few strictly commercial quail breeders. The idea of propagating quail in captivity for release in favorite hunting ground exerts a very powerful appeal to the sportsman, however, and many attempt it who have neither the time required for such exacting work, nor the financial resources adequate to tide them over periods of failure while they are acquiring experience.

Anyone contemplating going into quail propagating should first communicate with their State Game Commission to learn what can and cannot be legally done, should visit and study the methods used in successful quail rearing plants, and thoroughly familiarize themselves with the literature on the subject. Then if their early enthusiasm has not waned and they still desire to take up this work, it would be wise to start in a small way and enlarge the scope of operations after acquiring experience.

As a rule landowners interested in quail increase will be wise to confine their activities in this line to the improvement of food supply and cover and the protection of their birds from natural enemies as previously discussed in these articles, for quail are tremendously prolific creatures and multiply





rapidly where conditions are made especially favorable for them. If conditions afield are not highly favorable, it is worse than useless to release more or less tame hand-reared quail, for they cannot reasonably be expected to remain on the ground.



Relation of Domestic Animals to Quail Abundance

EVEN though cattle, horses, sheep and other hoofed animals are undeniably more important on the average farm than quail, the subject of their relationship is worthy of discussion, for many landowners are mystified as to why quail do not thrive on their property when the reason is plain enough to anyone familiar with the requirements and preferences of these birds. It not infrequently happens also that sportsmen purchase large tracts of land *primarily* for quail and other game, then go into the livestock business to help pay the expense of maintaining their property, only to discover later that the game birds do not thrive and increase as expected.

Livestock running at large affect both the nesting of the birds and their food supply. Quail frequently, it is true, bring off young successfully even in permanent pastures where small clumps of briars, or low-limbed pine saplings are avoided by grazing animals, the birds nesting in the edges of such safety zones. On the other hand, many nests are trampled under foot and destroyed when cattle or sheep are turned into grassy fields not previously grazed, or when they are "minded" over the nesting grounds of the birds during the summer months. The practice of "staking out"





cattle and mules, in a new location each day, is also destructive to quail nests, although many could be saved in the course of the long Southern nesting season if the ground within reach of the grazing animal were first carefully looked over.

The effect of summer grazing on quail food supply is apt to be disastrous. It is true that quail occur in fair abundance at times on "open range" where only a limited amount of year around grazing occurs, and may quite frequently be found during the hunting season in small, closely grazed permanent pastures in or near farming country, where they have been temporarily attracted by the easily available pine "mast," acorns, or the winged seeds of the sweetgum tree, for such feeds are obviously not injured by grazing and are easiest found on nearly bare ground. Summer grazing of quail range is, however, destructive to the native perennial beggarweeds, lespedezas (bush clovers), partridge pea, various climbing wild beans and peas and other leguminous plants that furnish the backbone of the quail's winter food supply. For this reason the birds are frequently scarce or absent where the bulk of the country is closely grazed. That such leguminous plants are really destroyed by summer grazing can be verified by anyone by comparing the vegetation on two sides of many a pasture fence.

The effect of summer grazing on ground cover may be as unfavorable from the quail standpoint as the effect on food supply, sheep and goats being the most destructive animals





in this respect. Of course the livestock may be so important to the landowner that it seems impracticable to attempt to correct conditions as an aid to quail, even though an abundance of these birds is greatly desired. It is well to know, however, why the birds are scarce in heavily grazed country, though abundant upon otherwise similar lands given over largely to the raising of cash crops of various small grains.

Of all the more important quail food producing plants the common Japan clover, or "lespedeza," a native of Asia which has spread over much of the Southeast in the last eighty years, stands up best under and furnishes grazing, and if several additional plants of similar characteristics could be introduced the problem of reconciling quail production and grazing might be largely solved. One of the Southern experiment stations has been interested in this problem, but has been unable as yet to finance the necessary experimental work.

The ranging of a limited amount of livestock over quail ground during the winter months only, causes comparatively little harm, although the effect on the weedy cornfields so favored by quail is bad, the weedy growths and corn stalks soon being trampled into the ground.

Hogs, of all the hoofed animals, may be really beneficial to quail interests in a variety of ways. For instance, quail are very fond of peanuts and the tubers of nutgrass, neither of which are ordinarily available to them without the assist-





ance of hogs, which they may follow closely for wasted bits of these tubers. Hogs are also responsible for a beneficial change of vegetation where they root up large patches in broom sedge or sod-bound lands, such valuable quail food producing plants as beggarweeds, partridge pea, ragweed and so forth replacing for a few seasons the uprooted grasses. It is probably true that wild "razorback" hogs eat the eggs in such quail nests as they find, but the Quail Investigation found many cases where nests of quail eggs hatched successfully in hog pastures holding only the domesticated breeds, which are not so successful in locating animal food. Where hogs are confined during the growing season of crops, and only allowed to roam at large during the winter months, their activities are likely to be at least as beneficial as otherwise to quail interests, especially in farming country where no special plantings for quail have been made.

Landowners sufficiently interested in quail can do a good deal for these birds, even though they own much livestock, by fencing off odd corners here and there for the birds, planting Japan clover ("lespedeza") around the borders of pastures, and protecting quail nests from destruction as much as possible. They can scarcely expect to have birds in equal abundance, however, with the growers of small grains who keep few domestic animals.



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